The following Listing of Claims will replace all prior versions, and listings, of claims in the application.

LISTING OF CLAIMS:

1. (Currently Amended) A phase locked loop frequency synthesizer, comprising:

a phase comparator being configured to compare ~~for comparing~~ phases of first and second signals applied thereto with each other and to output ~~outputting~~ a phase error signal when there is a phase difference between the first and second ~~two~~ signals;

a loop filter being configured to filter ~~for filtering~~ the phase error signal outputted from the phase comparator, to stabilize ~~and stabilizing~~ the filtered phase error signal, and to output a control signal;

a voltage controlled oscillator being configured to control ~~for controlling~~ frequency gain of a signal outputted in response to the control signal outputted from the loop filter;

a divider being configured to divide ~~for dividing~~ the frequency of the outputted ~~output~~ signal of the voltage controlled oscillator according to a division rate to apply the outputted signal ~~it~~ to the phase comparator as the second signal;

a voltage detector being configured to detect ~~for detecting~~ control voltage from the control signal of the voltage controlled oscillator; and

a controller being configured to calculate ~~for calculating~~ a variation in gain characteristics of the voltage controlled oscillator using the control voltage outputted from the voltage detector to adjust ~~and the division rate of the divider, and adjusting~~ gain of at least one of the phase comparator, the loop filter and the voltage controlled oscillator, and to control gain of a loop composed of the phase comparator, the loop filter, the voltage controlled oscillator and the divider to be ~~substantially~~ uniform.

2. (Original) The phase locked loop frequency synthesizer as claimed in claim 1, wherein the division rate of the divider is set by the controller.

3. (Original) The phase locked loop frequency synthesizer as claimed in claim 1, wherein the phase comparator includes a charge pump circuit, and phase gain of the

phase comparator is controlled by adjusting a current value of a driving bias current source included in the charge pump circuit.

4. (Original) The phase locked loop frequency synthesizer as claimed in claim 1, wherein the loop filter includes a variable gain amplifier, and voltage gain of the loop filter is controlled by adjusting a gain value of the variable gain amplifier.

5. (Original) The phase locked loop frequency synthesizer as claimed in claim 1, wherein the voltage detector is composed of an analog-digital converter.

6. (Currently Amended) The phase locked loop frequency synthesizer as claimed in claim 1, wherein the voltage controlled oscillator includes at least two sub-voltage controlled oscillators, and one of the sub-voltage controlled oscillators is activated according to a control signal provided by the controller.

7. (Currently Amended) The phase locked loop frequency synthesizer as claimed in claim 1, wherein the voltage controlled oscillator includes at least one inductor and one capacitor that determine a frequency band, and frequency gain of the voltage controlled oscillator is varied by controlling an impedance value of the inductor or capacitor.

8. (Currently Amended) A method for detecting frequency gain of a voltage controlled oscillator of a phase locked loop frequency synthesizer including a phase comparator ~~for~~ comparing phases of first and second signals applied thereto with each other and outputting a phase error signal when there is a phase difference between the first and second ~~two~~ signals, a loop filter ~~for~~ filtering the phase error signal outputted from the phase comparator, ~~and~~ stabilizing the filtered phase error signal, and outputting ~~to output~~ a control signal, a voltage controlled oscillator ~~for~~ controlling frequency gain of a signal output in response to the control signal outputted from the loop filter, and a divider ~~for~~ dividing the frequency of the outputted ~~output~~ signal of the voltage controlled oscillator according to a division rate to apply the outputted signal ~~it~~ to the phase comparator as the second signal, the method comprising the steps of:

a first step of setting the division rate of the divider to a predetermined first division rate, and detecting control voltage from the control signal;

a second step of setting the division rate of the divider to a predetermined second division rate, and detecting control voltage from the control signal; and

a third step of calculating the frequency gain of the voltage controlled oscillator using one selected from the group consisting of the frequency of the first signal, the control voltages detected at the first and second steps, and ~~the~~ first and second division rates,

the frequency gain of the voltage controlled oscillator being calculated by the following equation

Fin×(N1-N2)/(V1-V2),

Fin being the first signal, N1 and N2 denoting the first and second division rates, respectively, V1 and V2 representing the control voltages detected at the first and second steps, respectively.

9. (Cancelled).

10. (Currently Amended) A method for detecting frequency gain of a voltage controlled oscillator of a phase locked loop frequency synthesizer including a phase comparator ~~for~~ comparing phases of first and second signals applied thereto with each other and outputting a phase error signal when there is a phase difference between the first and second ~~two~~ signals, a loop filter ~~for~~ filtering the phase error signal outputted from the phase comparator, ~~and~~ stabilizing the filtered phase error signal, and ~~to~~ outputting ~~output~~ a control signal, a voltage controlled oscillator ~~for~~ controlling frequency gain of a signal output in response to the control signal outputted from the loop filter, and a divider ~~for~~ dividing the frequency of the outputted ~~output~~ signal of the voltage controlled oscillator according to a division rate to apply the outputted signal ~~it~~ to the phase comparator as the second signal, the method comprising the steps of:

a first step of setting the frequency of the outputted ~~output~~ signal of the voltage controlled oscillator to a predetermined first frequency;

a second step of detecting control voltage from the control signal;

a third step of controlling the division rate of the divider to vary the frequency of the outputted ~~output~~ signal of the voltage controlled oscillator by a predetermined frequency value, and detecting control voltage from the control signal;

a fourth step of calculating the frequency gain of the voltage controlled oscillator using the control voltages detected at the second and third steps and the predetermined frequency value; and

a fifth step of comparing the frequency of the outputted ~~output~~ signal of the voltage controlled oscillator with a predetermined second frequency and repeatedly performing the second and fourth steps until the frequency of the output signal has a value identical to ~~a~~the predetermined second frequency value,

the frequency gain of the voltage controlled oscillator being calculated by the following equation

Fstep/(V1-V2),

Fstep being the predetermined frequency, V1 denoting the control voltage detected at the second step, and V2 representing the control voltage detected at the third step.

11. (Cancelled).

12. (Currently Amended) A method for detecting frequency gain of a voltage controlled oscillator of a phase locked loop frequency synthesizer including a phase comparator ~~for~~ comparing phases of first and second signals applied thereto with each other and outputting a phase error signal when there is a phase difference between the first and second ~~two~~ signals, a loop filter ~~for~~ filtering the phase error signal outputted from the phase comparator ~~and~~, stabilizing the filtered phase error signal, and ~~to~~ outputting ~~output~~ a control signal, a voltage controlled oscillator ~~for~~ controlling frequency gain of a signal output in response to the control signal outputted from the loop filter, and a divider ~~for~~ dividing the frequency of the outputted ~~output~~ signal of the voltage controlled oscillator according to a division rate to apply the outputted signal ~~it~~ to the phase comparator as the second signal, the method comprising the steps of:

a first step of detecting a control voltage value from the control signal at a predetermined reference frequency;

a second step of varying the frequency of the outputted ~~output~~ signal of the voltage controlled oscillator from the reference frequency by a predetermined specific frequency and detecting control voltage from the control signal;

a third step of varying the frequency of the outputted ~~output~~ signal of the voltage controlled oscillator from the reference frequency by the predetermined specific frequency and detecting control voltage from the control signal; and

a fourth step of calculating the frequency gain of the voltage controlled oscillator using the control voltages respectively detected at the second and third steps and the frequency of the outputted ~~output~~ signal,

the frequency gain of the voltage controlled oscillator being calculated by the following equation

(F1-F2)/(V1-V2),

F1 being the frequency of the output signal at the second step, F2 being the frequency of the output signal at the third step, V1 denoting the control voltage detected at the second step, and V2 representing the control voltage detected at the third step.

13. (Cancelled).

14. (Currently Amended) A method for controlling a loop gain of a voltage controlled oscillator of a phase locked loop frequency synthesizer including a phase comparator ~~for~~ comparing phases of first and second signals applied thereto with each other and outputting a phase error signal when there is a phase difference between the first and second ~~two~~ signals, a loop filter ~~for~~ filtering the phase error signal outputted from the phase comparator, ~~and~~ stabilizing the filtered phase error signal, outputting ~~to output~~ a control signal, a voltage controlled oscillator ~~for~~ controlling frequency gain of a signal output in response to the control signal outputted from the loop filter, and a divider ~~for~~ dividing the frequency of the outputted ~~output~~ signal of the voltage controlled oscillator according to a division rate to apply the outputted signal ~~it~~ to the phase comparator as the second signal, the method comprising the steps of:

a first step of setting the frequency of the outputted ~~output~~ signal of the voltage controlled oscillator to a predetermined first frequency;

a second step of detecting control voltage from the control signal;

a third step of controlling the division rate of the divider to vary the frequency of the output signal of the voltage controlled oscillator by a predetermined frequency value, and detecting control voltage from the control signal;

a fourth step of calculating the frequency gain of the voltage controlled oscillator using the control voltages detected at the second and third steps and the predetermined frequency value;

a fifth step of comparing the frequency of the output signal of the voltage controlled oscillator with a predetermined second frequency and repeatedly performing the second and fourth steps until the frequency of the outputted ~~output~~ signal has a value identical to the second frequency value; and

a sixth step of setting a desired outputted ~~output~~ signal frequency of the voltage controlled oscillator, confirming ~~grasping~~ the frequency gain of the voltage controlled oscillator at the corresponding frequency as a value calculated through the first to fifth steps, and controlling gains of the phase comparator and loop filter by adjusting a driving bias variable current source of a charge pump circuit,

the frequency gain of the voltage controlled oscillator being calculated by the following equation

Fstep/(V1-V2),

Fstep being the predetermined frequency, V1 denoting the control voltage detected at the second step, and V2 representing the control voltage detected at the third step.

15. (Cancelled).

16. (Currently Amended) A method for controlling loop gain of a voltage controlled oscillator of a phase locked loop frequency synthesizer including a phase comparator ~~for~~ comparing phases of first and second signals applied thereto with each other and outputting a phase error signal when there is a phase difference between the first and second ~~two~~ signals, a loop filter ~~for~~ filtering the phase error signal outputted from the phase comparator, ~~and~~ stabilizing the filtered phase error signal, and outputting ~~to output~~ a control signal, a voltage controlled oscillator ~~for~~ controlling frequency gain of a signal output in response to the control signal outputted from the loop filter, and a divider ~~for~~ dividing the frequency of the outputted ~~output~~ signal of the voltage controlled oscillator according to a

division rate to apply the outputted signal ~~it~~ to the phase comparator as the second signal, the method comprising the steps of:

a first step of detecting a control voltage value from the control signal at a predetermined reference frequency;

a second step of varying the frequency of the outputted ~~output~~ signal of the voltage controlled oscillator from the reference frequency by a predetermined specific frequency and detecting control voltage from the control signal;

~~a third step of varying the frequency of the output signal of the voltage controlled oscillator from the reference frequency by the specific frequency and detecting control voltage from the control signal;~~

a third ~~fourth~~ step of calculating the frequency gain of the voltage controlled oscillator using the control voltages respectively detected at the second ~~and third~~ steps and the frequency of the outputted ~~output~~ signal; and

a fourth ~~fifth~~ step of controlling gain of the phase comparator or gain of the loop filter, to control the loop gain to be ~~substantially~~ uniform,

the frequency gain of the voltage controlled oscillator being calculated by the following equation

(F1-F2)/(V1-V2),

F1 being the frequency of the output signal at the second step, F2 being the frequency of the output signal at the second step, V1 denoting the control voltage detected at the second step, and V2 representing the control voltage detected at the second step.

17. (Cancelled).

18. (Currently Amended) A method for controlling frequency gain of a voltage controlled oscillator of a phase locked loop frequency synthesizer to be ~~substantially~~ uniform, the frequency synthesizer including a phase comparator ~~for~~ comparing phases of first and second signals applied thereto with each other and outputting a phase error signal when there is a phase difference between the first and second ~~two~~ signals, a loop filter ~~for~~ filtering the phase error signal outputted from the phase comparator, ~~and~~ stabilizing the filtered signal, and outputting ~~to output~~ a control signal, a voltage controlled oscillator ~~for~~ controlling frequency gain of a signal output in response to the control signal outputted from the loop

filter, and a divider ~~for~~ dividing the frequency of the outputted ~~output~~ signal of the voltage controlled oscillator according to a division rate to apply the outputted signal ~~it~~ to the phase comparator as the second signal, the method comprising the steps of:

a first step of detecting a control voltage value from the control signal at a predetermined reference frequency;

a second step of varying the frequency of the outputted ~~output~~ signal of the voltage controlled oscillator from the reference frequency by a predetermined specific frequency and detecting control voltage from the control signal;

~~a third step of varying the frequency of the output signal of the voltage controlled oscillator from the reference frequency by the specific frequency and detecting control voltage from the control signal;~~

a third ~~fourth~~ step of calculating the frequency gain of the voltage controlled oscillator using the control voltages respectively detected at the second ~~and third~~ steps and the frequency of the outputted ~~output~~ signal; and

a fourth ~~fifth~~ step of comparing the calculated frequency gain with a predetermined reference gain and controlling the frequency gain of the voltage controlled oscillator to be ~~substantially~~ uniform,

the frequency gain of the voltage controlled oscillator being calculated by the following equation

(F1-F2)/(V1-V2),

F1 being the frequency of the output signal at the second step, F2 being the frequency of the output signal at the third step, V1 denoting the control voltage detected at the second step, and V2 representing the control voltage detected at the second step.

19. (Cancelled).